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DEATH OF FISHES IN THE BAY OF FUNDY.

BY A. LEITH ADAMS, M. D.

AMONG all the fluctuations of opinion respecting the nature of the causes to which the phenomena of the physical sciences are referrible, none in so short a period of time have undergone greater changes than we see represented in the history and progress of Geology. The first observers, more engaged in the discovery of appearances than in seeking to divine their causes, were led, by the wonderful but imperfect scenes constantly opening out before them, to infer, that the mysterious and extraordinary assemblages of strata and organic remains therein imbedded were owing to causes in every way distinct, both in kind and degree, from the laws which now govern the material universe. But the gigantic strides made in this science during the last half century have induced philosophers to conclude that throughout the vast periods of time of which geology takes cognizance, there has never been any intervention to the working of fixed and invariable laws of change. The elevation of land, distortion and dislocation of rocks, together with their assemblages of organic remains, were considered by the early observers to have been brought about by sudden and violent oscillations of level, earthquakes and diluvial agencies far exceeding

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both in extent and intensity any similar phenomena of which history has preserved records. But the modern progress of enlightenment has greatly modified such opinions, and now geologists, not content with the speculations of their predecessors, are earnestly endeavoring to interpret the GREAT STONE BOOK by comparing the former mutations in the earth's surface with those of our own times, and thus the science is being gradually devested of the supernatural appearances and fanciful conjectures, which, for many years, not only encompassed but also retarded its advancement. Even the simple enumeration of the discoveries which of late years have brought about this grand revolution in the thoughts and opinions of the modern school of geologists would far exceed our limits; we will therefore elucidate the subject by an example which came under our own notice, and attempt to show the reader that many similar appearances among the rock formations may possibly have been occasioned by similar causes.

In the Bay of Fundy, opposite the Island of Grand Manan, there is a large gap in the coast-line named Passamaquoddy Bay, into which several fair-sized rivers drain. One, called the Magagudavic River, is reached by means of a long fiord of several miles in length. At a short distance westward, there is a small creek named Anderson's Cove, formed in the trappean rocks of which the coast-line is composed. These beds are considered by geologists as belonging to the Devonian or Old-Red Sandstone formations of Southern New Brunswick. Anderson's Cove is, in fact, the sea-ending of a ravine down which runs a small stream into a very muddy lagoon of upwards of 1,300 feet in circumference. The latter is oval in shape, and communicates directly at high tide with Anderson's Cove by means of a narrow and rocky channel, filled with masses of amygdaloid trap, fragments of which are mixed with the mud forming at the bottom of the lagoon. There is a beach of sand in front of the lagoon, besides a sea-wall formed of sand and masses of rocks and stranded logs of wood piled in disorder along the shore; so that, excepting during furious gales, the only direct communication with the lagoon is by the passage just mentioned. During high tide the waves rush up this channel with force stirring up the mud of the lagoon, when the water in the basin frequently assumes almost the consistency of pea-soup. Thus the lagoon is a shallow morass of brackish water at low tide, receiving a constant supply of fresh water from the stream which is depositing its debris on the slimy bottom; moreover, land-shells and other organic remains are being conveyed by the stream or washed by the rain into the basin, whilst on the other hand the powerful tidal wave of the Bay of Fundy brings up quantities of marine Mollusca, Radiata, etc., remains of which strew its bottom and sides. Such, in all probability, has been the usual state of matters in this quiet corner of the bay for unreckoned ages, broken only at long intervals by occurrences such as we shall now describe.

On the 24th of September, 1867, a very heavy gale from the west blew directly into Anderson's Cove, and more especially on the entrance of the lagoon at the eastern end. The result was, that the mud became disturbed to an unusual extent, and the amount of the water in the area was doubled in quantity. During the gale enormous numbers of dead fishes were seen floating on the surface of the turbid waters of the morass, and on the following morning when the hurricane had subsided, a spectacle presented itself, baffling anything of the kind observed by the residents on previous occasions. The entire lagoon, from its entrance to the limits of the tide, was covered with dead fishes. The species, with the exception of a few mackerel and New York flounder, was found to be the young of the American herring (*Clupea elongata*) averaging about six inches in length. This fish is said to spawn in the neighborhood, and usually large shoals had been observed for some weeks previously in and about Anderson's Cove. The author chanced to be in the vicinity about a fortnight after the occurrence just mentioned, and, when on his way to the scene of the disaster, was made uncomfortably aware of the proximity even at the distance of two miles, by an intolerable stench from decomposing fish, contaminating the atmosphere in every direction for five miles around Anderson's Cove. The smell was found to emanate not only from the latter, but also from the fields around, where many cart-loads had been deposited by the farmers; nevertheless, the quantities of rotting fish around the margin of the lagoon seemed very little diminished by the amount taken away for manure, not to mention what had been consumed by the flocks of gulls and crows which were feeding sumptuously on their remains.

After skirting the shore of Anderson's Cove we reached the entrance of the narrow, tortuous passage leading to the lagoon; here the first traces of the disaster were manifested by enormous quantities of fishes, impacted between and among the fallen masses of rock, which were literally besmeared all over with the crushed flesh and bones of herrings, whilst the sides and bottom of the lagoon were covered with their entire and mangled remains, forming heaps several feet in depth, more especially in places where there had evidently been eddies, whilst the limits of the tide were distinctly marked by a pile of their bodies which fringed the basin of the lagoon. On the muddy bottom they lay as thick as herrings in a barrel, interspersed with remains of crabs, lobsters, sea-mussels, and other shells, together with enormous numbers of the dead bodies of star-fish, etc.

A friend, who resides in the neighborhood, suggested that the shoal had been chased into the inclosure by sharks, or other predaceous fishes, and were subsequently suffocated by the muddy waters of the lagoon. But the mangled remains in the passage and shallow water in Anderson's Cove, together with the fury of the gale, rather seemed to indicate that the vast assemblage, getting into shallow water, and under the influence of the breakers, was driven pell-mell up the passage and against its rocky sides into the lagoon, where the survivors perished from the combined fury of the waves and the muddy waters. During our examination of the bottom of the lagoon it was apparent, even in the short space of time that had elapsed since the gale, that many of the fishes had been completely covered over by mud conveyed or re-disturbed by every tide, and deposited also from the water-shed around the morass. No doubt at that rate the whole of the organic remains, before long, became buried in the soft mire, and perhaps some geologist, in the far distant future, will be speculating on the cause or causes which brought about such a vast congregation of marine and land animals in so limited an area, just as he now theorizes on the probable causes of those vast assemblages of fossil animals he is accustomed to observe in many rock formations. For we have only to suppose one or more geological epochs to have passed away, and a slight elevation of the land, when, if a section were made of the spot where this lagoon now stands, there would be found an alluvial deposit on the surface, succeeded by a sedimentary stratum containing fragments of the Devonian trap-rock of the neighborhood, accompanied by the vast assemblage of organic remains just described, and followed, perhaps, by similar objects at greater depths, succeeded, no doubt, by traces of the Glacial epoch, which are so vividly portrayed on the surface of the surrounding country at the present day; and lastly, the old Devonian conglomerate in which the lagoon now stands. And whilst each will supply memorials of its own peculiar but relatively distant epochs, none will furnish more lasting and wonderful phenomena than the deposit which contains the fishes destroyed during the gale of the 24th of September, 1867.

Occurrences similar to that just described are apparently not common, at least along the coast of the Bay of Fundy, but enormous shoals of herrings and other fishes are met with at stated seasons, so that the accident of the 24th of September might occur again anywhere under the same favorable conditions. Moreover, it may be pretty confidently surmised, that the fish stranded in the lagoon were but a very small portion of the original shoal which entered Anderson's Cove, and thus, supposing the locality had been many times larger, there would have been no diminution in relative density of the dead fishes on its area.

Another example is recorded in the Journal of the Geological Society of London.* Thousands of dead fishes, thrown on the coast of Madras, were afterwards enveloped in sand and mud along with other marine animals and plants, so as to form a densely packed stratum of fishes, etc., of unknown breadth, but extending for a vast distance along the coast-line. The fishes were supposed to have been destroyed by the enormous fall of rain from the south-west monsoon, rendering the sea-water less saline. Be that the cause or not, it is by such facts as these, compared with similar phenomena of by-gone epochs, that the geologist is enabled to arrive at just conclusions, and it is in this way that the science of geology is progressing.

THE ORCHIDS.

BY C. M. TRACY.

It was the greatest step forward ever made at once in the study of plants, when Jussieu found out that there was a grand line of division running through the whole vegetable kingdom, with seeds on one side that might be split into two parts like the pea and the acorn, and those on the other that could not, like the kernel of corn and the grain of barley. For (not to tire the reader with technical words) it was directly seen that the same line would clearly distinguish between those plants that had a bark and made new wood between that and the older wood within, and thus *grew on*

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* June, 1862.